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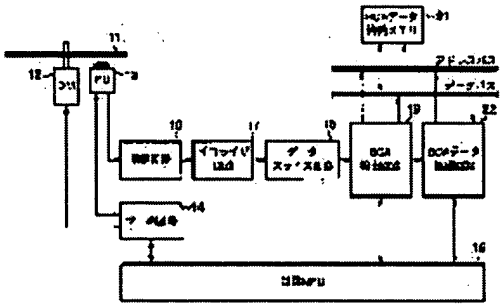
(54) DEVICE AND METHOD FOR REPRODUCING DISK

(57)Abstract:
PROBLEM TO BE SOLVED: To reproduce the BCA data with simple arrangement by detecting the edge of the second data read with a pickup within an occurrence period of a prescribed width window having a period corresponding to the channel bit period of the second data.



SOLUTION: A read-in area of an optical disk 11 is reproduced by a CLV system, and at the point when the rotational speed of the optical disk is stabilized, a rotational servo to the optical disk 11 is turned off, and an optical pickup 13 is moved to a BCA data recording area, and a channel detecting window is opened in a predictive cycle, and a BCA channel bit is detected, and the data are reproduced. Thus, a CAV servo and data extracting channel bit clock generation are eliminated, and the BCA data are reproduced from the optical disk 11 without complicated processing. Further, the central position of the channel bit detecting window is adjusted whenever a channel bit is detected, and periodical dispersion in cutting precision coarseness peculiar to the BCA becomes followable.

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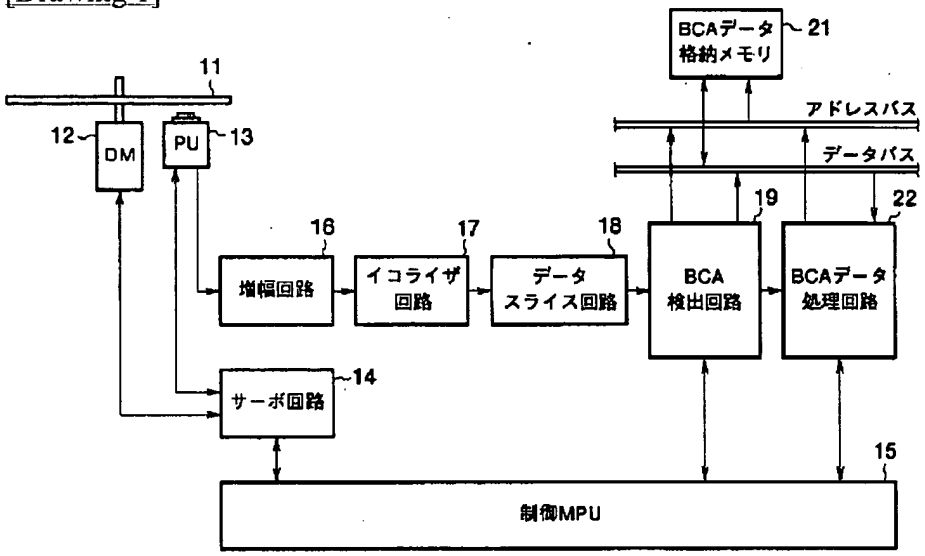
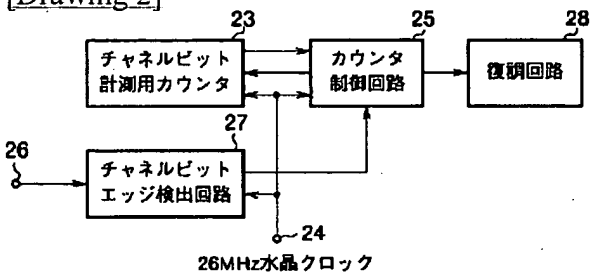
DRAWINGS

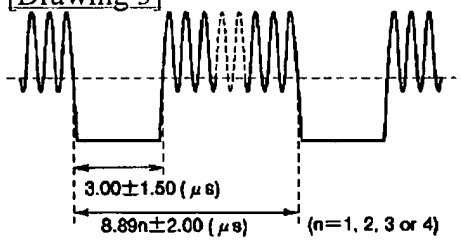
[Drawing 1]



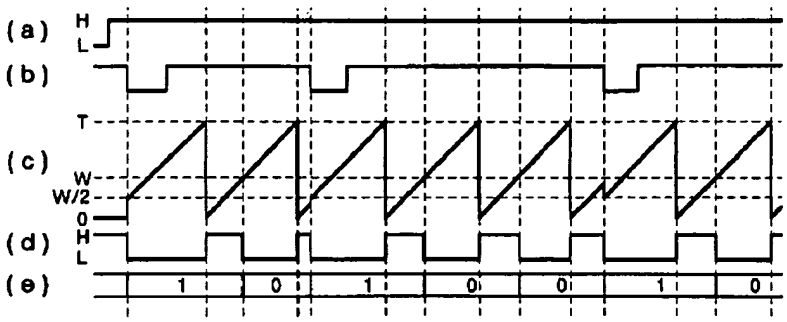
[Drawing 2]



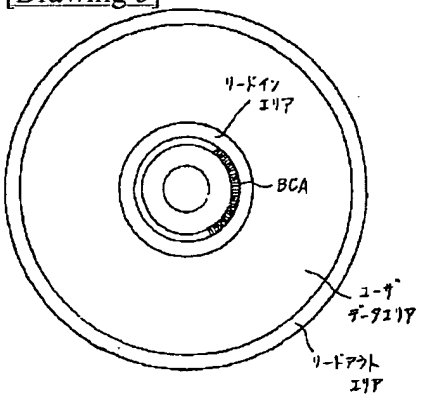
[Drawing 3]



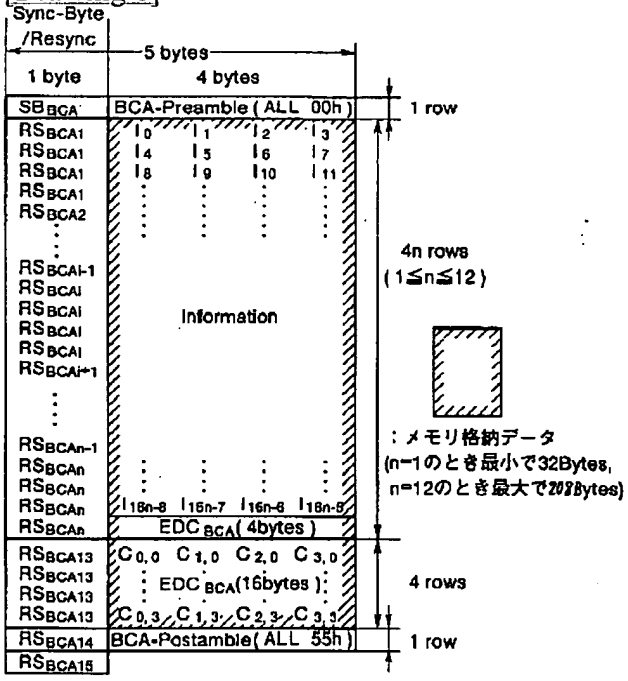
[Drawing 4]



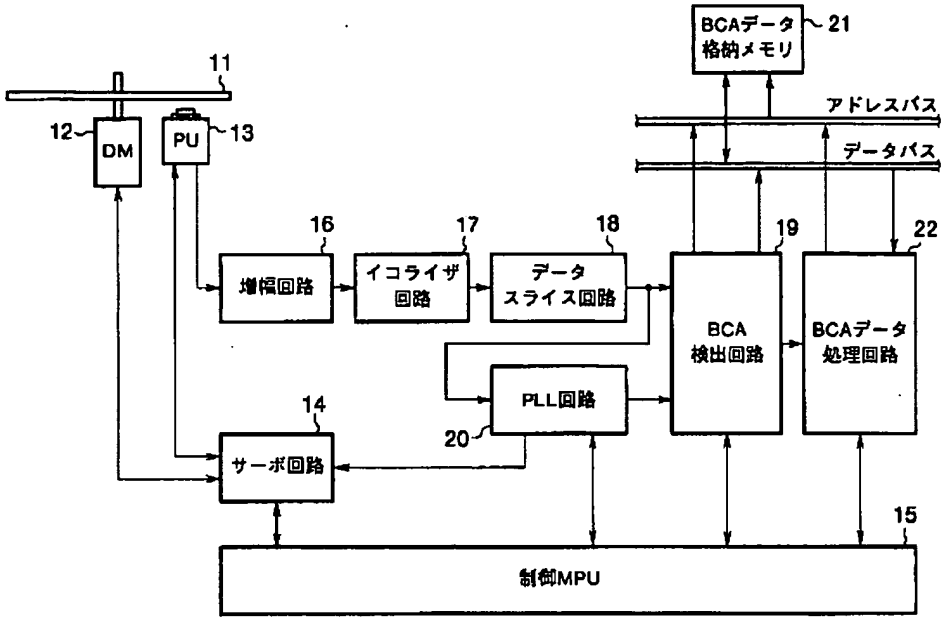
[Drawing 5]



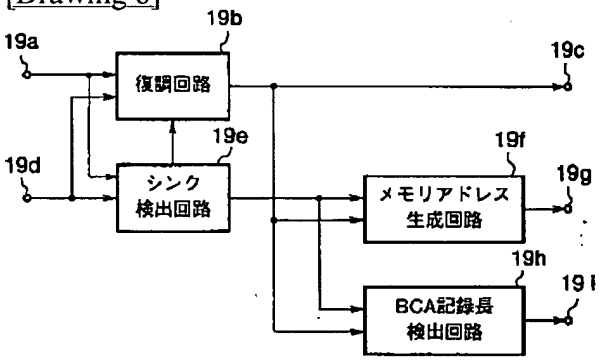
[Drawing 6]



[Drawing 7]



[Drawing 8]



[Drawing 9]

0	1	2	3
4	5	6	7
8	9	10	11
12	13	14	15
16	17	18	19
20	21	22	23
24	25	26	27
28	29	30	31
32	33	34	35
36	37	38	39
⋮	⋮	⋮	⋮
⋮	⋮	⋮	⋮
⋮	⋮	⋮	⋮
⋮	⋮	⋮	⋮
176	177	178	179
180	181	182	183
184	185	186	187
188	189	190	191
192	193	194	195
196	197	198	199
200	201	202	203
204	205	206	207

48 rows

4 rows

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DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Field of the Invention] This invention relates to amelioration of the disk regenerative apparatus which plays optical disks, such as DVD (Digital Video Disk), and the disk playback approach.
[0002]
[Description of the Prior Art] As everyone knows, recently, DVD is developed as an optical disk which recorded a vast quantity of abbreviation 5G bit data on one side, and the DVD regenerative apparatus which reproduces this DVD is also spreading through a commercial scene.
[0003] By the way, after a production process is completed at works etc. to this DVD, as shown at drawing 5 , the so-called BCA (Burst Cutting Area) code may be further recorded on the specific region of inner circumference by the YAG laser rather than that lead-in groove area.
[0004] Drawing 6 shows the structure of such BCA data. First, the number of BCA user data has 16n - four (1<=n<=12) cutting tools' adjustable information field, and 4 bytes of EDC (Error Detection Code) parity and 16 bytes of ECC (Error Correction Code) parity are added to this.
[0005] And 1 byte of sink data RSBCAn are added to this adjustable information field and EDC parity every 4 bytes, respectively, and it is 1 byte per 4 bytes of sink data RSBCA13 to ECC parity. It is added.

[0006] Moreover, as for this BCA data, the BCA-Preamble data which are 4 bytes which is "00 (hexadecimal)" with 1 byte of sink data SBBCA, respectively are added to that head part.
[0007] Furthermore, this BCA data is 1 byte of sink data RSBCA14 after that ECC parity. BCA-Postamble which is 4 bytes which is "55 (hexadecimal)", respectively Data are added and 1 byte of sink data RSBCA15 are added after that.
[0008] And each sink data SBBCA and RSBCAn, RSBCA13, RSBCA14, and RSBCA15 It consists of an eight-channel bit showing a specific sink pattern, and an eight-channel bit showing a frame number (n), respectively. In addition, the modulation regulation from which 1 bit turns into a two-channel bit is followed.
[0009] Here, although the number of user data of one frame is formed by 16 bytes, as for the number of user data, only the n-th frame becomes 12 bytes, and 4 bytes of EDC parity is added. For example, if it becomes n=5, the number of user data becomes 16x5-4=76 byte, and 4 bytes of EDC parity will be added after the sink data RSBCA5 of the 4th line of five frames.
[0010] Moreover, 16 bytes of Lead Solomon ECC parity which interleave processing is carried out and is added to the lengthwise direction of this BCA DS belongs to 13 frames irrespective of the user data length. For example, if it becomes n=5, it will be the sink data RSBCA13 after the EDC parity of five frames. It will appear and ECC parity will continue.
[0011] As mentioned above, rather than the lead-in groove area of DVD, it has still more sufficient width of face on the concentric circle of inner circumference, and this BCA data is recorded, and its data non-record section in the BCA data storage area on DVD increases, so that a data length is short.
[0012] And the modulation regulation of this BCA data is assigning the two-channel bit of "10" and

"01" to the 1-bit data showing "0" and "1", respectively. Moreover, a specific sink pattern is "01000110" from a high order, and the frame number following this is modulating the 4-bit data showing "0"- "13" in the eight-channel bit according to the modulation regulation mentioned above.
[0013] If this modulation regulation is followed, it will be the minimum polarity-reversals spacing Tmin of data. It is set to 1T and is the maximum polarity-reversals spacing Tmax. It is set to 4T. However, if said modulation regulation is followed, this 4T pattern will appear only in sink data.
[0014] Drawing 7 shows the refreshable disk regenerative apparatus for the optical disk with which such BCA data were recorded. In drawing 7 , a sign 11 is the optical disk with which BCA data were recorded, and a rotation drive is carried out by the disk motor 12. Moreover, the signal recording surface of an optical disk 11 is countered, and optical pick-up 13 is installed.
[0015] As for this disk motor 12, that rotational speed is controlled by the servo circuit 14. Moreover, while a tracking servo and a focus servo are given, migration in the direction of a path of an optical disk 11 is controlled. [as opposed to / in optical pick-up 13 / the objective lens which is not illustrated by the servo circuit 14]
[0016] Here, when reproducing the BCA data of an optical disk 11, the control (Micro-Processing Unit) MPU 15 which controls actuation of a disk regenerative apparatus in generalization moves optical pick-up 13 to the record section of BCA data while giving a CAV (Constant Angular Velocity) servo by the servo circuit 14 so that an optical disk 11 may be kept at 24Hz (1440rpm) which is the optimal rotational frequency for playback of BCA data.
[0017] And after minding an amplifying circuit 16 and the equalizer circuit 17, the electrical signal corresponding to the BCA data outputted from optical pick-up 13 is supplied to the data slicing circuit 18, and is made binary. This binary-ized signal is supplied to the BCA detector 19 and the PLL (Phase Locked Loop) circuit 20.
[0018] Among these, the PLL circuit 20 generates a channel bit clock from the inputted binary-ized signal, and is outputting it to the BCA detector 19. Moreover, from the inputted binary-ized signal, the BCA detector 19 samples data based on a channel bit clock, and is generating the BCA detection channel bit.
[0019] And in this BCA detector 19, the frame number has been obtained by detecting a sink pattern and restoring to the data of the eight-channel bit which continues after that out of a BCA data stream, based on a channel bit clock and a BCA detection channel bit.
[0020] Then, this BCA detector 19 generates the line numbers in a frame from 0 to 3 to the obtained frame number, determines the address to the BCA data storage memory 21, and carries out the sequential storage of the BCA data to which it restored. 208 bytes is recorded, when this BCA data storage memory 21 is n= 12 when BCA data are the longest that is,.
[0021] Moreover, error correction processing based on [in the BCA data recorded on this BCA data storage memory 21] EDC parity and ECC parity by the BCA data-processing circuit 22 is performed.
[0022] Drawing 8 shows the detail of the above-mentioned BCA detector 19. That is, the BCA binary-ized signal outputted is outputted to a data bus through input terminal 19a, demodulator circuit 19b, and output terminal 19c from the above-mentioned data slicing circuit 18. Moreover, the channel bit clock outputted is supplied to demodulator circuit 19b and sink detector 19e through 19d of input terminals from the above-mentioned PLL circuit 20.
[0023] And the output of the above-mentioned demodulator circuit 19b and the output of sink detector 19e are outputted to the BCA data-processing circuit 22 through 19h of BCA record length detectors, and output terminal 19i while they are outputted to an address bus through 19f of memory address generation circuits, and 19g of output terminals.
[0024] if the above-mentioned optical pick-up 13 arrives at a BCA data storage area from the data non-record section of an optical disk 11 here -- sink data SBBCA from -- the starting channel bit is detected. Then, this sink data SBBCA And the PLL circuit 20 locks and the channel bit clock of normal comes to be obtained in the hit which reproduces BCA-Preamble data.
[0025] At this time, first, the sink pattern of the sink data RSBCA1 is detected, and the address "0" is generated in the BCA data storage memory 21 in the BCA detector 19. Then, the BCA detector 19

performs data recovery processing which is detected and which makes it 1 byte for every 16-channel bit, and is incrementing the address each time.
[0026] Thus, when the data for 4 bytes were recorded on the BCA data storage memory 21 next, the sink data RSBCA1 should be detected again, but even if undetectable, it continues without changing data recovery spacing and the increment of the address as what has detected sink data in false, and the BCA detector 19 is performing the so-called synchronous protection.
[0027] Moreover, if the BCA detector 19 sets up the sink detection window about **two-channel bit width of face and sink data are detectable in this window to the prediction location which detects sink data, it will perform that location amendment and will correct subsequent data recovery synchronizations.
[0028] in addition, the sink data detected at this time -- RSBCA(s)10 other than [2] RSBCA1 (for example, RSBCA) etc. -- when it is a value, the BCA detector 19 considers that it is a detection error, and is made not to change the address.
[0029] and the sink data generated next when the recovery data for 16 bytes are recorded on the BCA data storage memory 21 -- RSBCA2 or RSBCA13 it must be -- although it comes out, the BCA detector 19 is not based on a frame number, but makes the increment of the address continue, and is made to continue without also changing a data recovery synchronization
[0030] That is, even if there is modification data recovery synchronous [by location amendment of the **two channel bit by sink data], an increment is continued about the address. Thus, the address to each cutting tool of the user data, its EDC parity, and ECC parity at the time of generating the address will be generated as shown in drawing 9 . A recovery and record of data are performed by the above procedure, and record actuation is ended when 16 bytes of data with which the sink data RSBCA13 were added are recorded.
[0031]
[Problem(s) to be Solved by the Invention] However, in the above conventional disk regenerative apparatus, while giving a CAV servo to an optical disk 11 so that the optimal rotational speed (24Hz) may be maintained in order to reproduce BCA data, it is necessary to generate the channel bit clock for data sampling by the PLL circuit 20. Therefore, the circuit for BCA playback had to be added to the usual DVD regenerative circuit, and while enlarging, complexity and the problem that processing also becomes complicated have produced [circuitry] the rotation servo and the PLL circuit.
[0032] Then, this invention was not made in consideration of the above-mentioned situation, and does not need complicated processing, but it aims at offering the very good disk regenerative apparatus and the disk playback approach which made it possible to reproduce BCA data from on a disk with a simple configuration.
[0033]
[Means for Solving the Problem] The disk regenerative apparatus concerning this invention is aimed at what plays the disk with which the 2nd data based on laser cutting was recorded near the field where the 1st data was recorded.
[0034] And where a rotation servo is given to a disk so that it may become the rotational speed corresponding to playback of the 1st data While turning OFF this rotation servo, by the control means which moves the pickup for reading record data in a disk to the field to which the 2nd data was recorded, and this control means A rotation servo is turned OFF and pickup in the condition of having arrived at the field to which the 2nd data was recorded A window generating means to generate the window of the predetermined width of face which has a period corresponding to the channel bit period of the 2nd data, It has a detection means to detect whether the edge of the 2nd data read by pickup within between [of the window by this window generating means] nascent states is obtained.
[0035] Moreover, the disk playback approach concerning this invention is aimed at the approach of playing the disk with which the 2nd data based on laser cutting was recorded near the field where the 1st data was recorded.
[0036] And after giving a rotation servo to a disk so that it may become the rotational speed corresponding to playback of the 1st data While turning OFF this rotation servo, according to the 1st

process which moves the pickup for reading record data in a disk to the field to which the 2nd data was recorded, and this 1st process The 2nd process at which a rotation servo is turned OFF, and pickup generates the window of the predetermined width of face which has a period corresponding to the channel bit period of the 2nd data after arriving at the field to which the 2nd data was recorded, It has the 3rd process which detects whether the edge of the 2nd data read by pickup within between [of the window by this 2nd process] nascent states is obtained.

[0037] According to the above configurations and approaches, a rotation servo is turned OFF, after giving a rotation servo so that it may become the rotational speed corresponding to playback of the 1st data at a disk. Since it detected whether the edge of the 2nd data would be obtained in the window generated with the period which was moved to the 2nd data storage area and predicted pickup beforehand Like before, since generation of a rotation servo or the channel bit clock for data sampling is not needed, the 2nd data can be reproduced from on a disk with a simple configuration, without needing complicated processing.

[0038]

[Embodiment of the Invention] Hereafter, the gestalt of implementation of this invention is explained to a detail with reference to a drawing. In drawing 1 , the same sign is attached and shown in the same part as drawing 7 R> 7. That is, he is trying to have a circuit as deleted the PLL circuit 20 for generating a channel bit clock from the BCA binary-ized signal outputted from said data slicing circuit 18, instead shown in said BCA detector 19 at drawing 2 .

[0039] In drawing 2 , a sign 23 is a counter for channel bit measurement, and is measuring BCA channel bit 1T piece expected value by counting the crystal clock of the constant frequency supplied to the clock input terminal 24. As the 1T piece shows a BCA channel bit to drawing 3 , the rotational frequency of an optical disk 11 is 8.89**2 microseconds in 24Hz, and 4T piece is set to 8.89x4**2 microseconds.

[0040] Then, when the frequency of the crystal clock which the above-mentioned counter 23 for channel bit measurement counts is set to 26MHz, it becomes the conversion to which 179 to 284 clock goes into 1T piece, and 872 to 977 clock goes into 4T piece. And it is considering as 128 clock width of face so that 1 T piece expected value may be used as 232 clocks of a pin center,large and it can follow in footsteps of fluctuation of the bit periods from 1T to 4T as window width for channel bit detection W.

[0041] Here, in actually reproducing BCA data, control MPU 15 generates a command in the servo circuit 14 so that the lead-in groove area of an optical disk 11 may be reproduced by the CLV (Constant Linear Velocity) method. And it is a time (the rotational speed of the optical disk 11 in this time serves as a value near 24Hz suitable for reproducing a BCA data storage area) of rotation of an optical disk 11 being stabilized, and control MPU 15 generates a command so that optical pick-up 13 may be moved to the BCA data storage area of an optical disk 11, while making the roll control of the disk motor 12 an OFF state to the servo circuit 14.

[0042] In this case, if it is the time amount of 2 [required to read BCA data, since it will take about several seconds before falling sharply / the rotational speed of an optical disk 11 / from 24Hz, although the rotational speed of an optical disk 11 will be automatically slowed down by making the roll control of the disk motor 12 into an OFF state] - 3 rotation extent, the rotational speed of an optical disk 11 will fully be held at about 24Hz.

[0043] Then, control MPU 15 generates a command in the BCA detector 19 so that detection of BCA data may be made to start. Then, in response to this command, the window for channel bit detection is made into an open condition in the counter control circuit 25 of the BCA detector 19.

[0044] On the other hand, the outputted BCA binary-ized signal is supplied to the channel bit edge detector 27 through the input terminal 26 from said data slicing circuit 18. This channel bit edge detector 27 detects, the BCA channel bit, i.e., the fall edge, of the inputted BCA binary-ized signal, and is outputting that detecting signal to the above-mentioned counter control circuit 25.

[0045] Then, when the detecting signal from the channel bit edge detector 27 is supplied, this counter control circuit 25 sets one half of the values of window width W for channel bit detection (here 128) as the above-mentioned counter 23 for channel bit measurement, and makes count-up start from that set point in the open condition of the window for channel bit detection.

[0046] Moreover, when the counter control circuit 25 closes the window for channel bit detection at this time and the counted value of the counter 23 for channel bit measurement is in agreement with T (here 232), the counted value of the counter 23 for channel bit measurement is reset to 0.
[0047] Henceforth, if the counted value of the counter 23 for channel bit measurement opens the window for channel bit detection between 0 - W and the fall edge of BCA data is detected, the counter control circuit 25 will set W/2 as the counter 23 for channel bit measurement, will close the window for channel bit detection, and will output the BCA channel bit detection value 1 to a demodulator circuit 28 at this time.
[0048] Moreover, before the counted value of the counter 23 for channel bit measurement reaches W that is, when it is in the open condition of the window for channel bit detection and the fall edge of BCA data is not detected, the counter control circuit 25 closes the window for channel bit detection, and outputs the BCA channel bit detection value 0 to a demodulator circuit 28 at this time.
[0049] Drawing 4 (a) - (e) shows the above actuation by the wave. That is, drawing 4 (a) shows the signal corresponding to a BCA data detection instruction, is reversed [on H (High) level] from L (Low) level, and shows that BCA data detection was required. Moreover, drawing 4 (b) shows the BCA data supplied to an input terminal 26.
[0050] Furthermore, drawing 4 (c) shows the counted value of the counter 23 for channel bit measurement. It is the fall of the BCA data whose counter 23 for channel bit measurement of this is carrying out circulation counting even of the 0-T (here 232) fundamentally, and shows it in this drawing (b), and counted value is set as W/2.
[0051] Moreover, drawing 4 (d) shows the window for channel bit detection. Although the counted value of the counter 23 for channel bit measurement will be in the open condition of H level between 0 - W, this window for channel bit detection is the fall of BCA data, and is made with the closed state of L level.
[0052] And drawing 4 (e) shows the detection value of a BCA channel bit. This BCA channel bit detection value is set to 1 when the fall of BCA data is detected within the open period of the window for channel bit detection, and when the fall of BCA data is not detected within the open period of the window for channel bit detection, it is set to 0.
[0053] In addition, when the condition that the fall of BCA data is not detected within the open period of the window for channel bit detection occurs more than the count of predetermined, it makes the window for channel bit detection an open condition unconditionally, and returns to an initial state. And based on the channel bit detection value acquired by doing in this way, sink data are detected, it restores to BCA data as usual, the address is generated, and it records on the BCA data storage memory 21.
[0054] When according to the above-mentioned gestalt of operation the lead-in groove area of an optical disk 11 is reproduced by CLV and the rotational speed of an optical disk 11 is stabilized, while making the rotation servo to an optical disk 11 into an OFF state, optical pick-up 13 is moved to a BCA data storage area, and he detects a BCA channel bit and is trying to reproduce BCA data by making the window for channel bit detection open wide with the period predicted beforehand.
[0055] For this reason, since a CAV servo is not needed like before and it is not necessary to generate the channel bit clock for data sampling, BCA data can be reproduced from on an optical disk 11 with a simple configuration, without needing complicated processing.
[0056] Moreover, since the pin center,large location of the window for channel bit detection is adjusted in the Xtal precision whenever it detects a channel bit, it can follow in footsteps of periodic dispersion by the granularity of a cut precision peculiar to BCA easily. In addition, this invention is not limited to the above-mentioned gestalt of operation, in the range which does not deviate from that summary this outside, can deform variously and can be carried out.
[0057]
[Effect of the Invention] As explained in full detail above, according to this invention, complicated processing is not needed, but the very good disk regenerative apparatus and the disk playback approach which made it possible to reproduce BCA data from on a disk with a simple configuration can be offered.

[Translation done.]

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DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]
[Drawing 1] The block block diagram showing the gestalt of operation of the disk regenerative apparatus concerning this invention.
[Drawing 2] The block block diagram showing the detail of the important section in the gestalt of this operation.
[Drawing 3] Drawing showing the BCA data wave in the gestalt of this operation.
[Drawing 4] Drawing showing the wave of each part in the gestalt of this operation.
[Drawing 5] The top view shown in order to explain the record section of the BCA data on an optical disk.
[Drawing 6] Drawing shown in order to explain a format of these BCA data.
[Drawing 7] The block block diagram showing the conventional disk regenerative apparatus which reproduces these BCA data.
[Drawing 8] The block block diagram showing the detail of the important section in this disk regenerative apparatus.
[Drawing 9] Drawing showing the example of generation of the address in this disk regenerative apparatus.
[Description of Notations]
11 -- Optical disk
12 -- Disk motor,
13 -- Optical pick-up
14 -- Servo circuit,
15 -- Control MPU
16 -- Amplifying circuit,
17 -- Equalizer circuit,
18 -- Data slicing circuit,
19 -- BCA detector,
20 -- PLL circuit,
21 -- BCA data storage memory,
22 -- BCA data-processing circuit,
23 -- Counter for channel bit measurement,
24 -- Clock input terminal,
25 -- Counter control circuit,
26 -- Input terminal,
27 -- Channel bit edge detector,
28 -- Demodulator circuit.

[Translation done.]